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Dairy Herd Improvement Letter

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NATIONAL COOPERATIVE
DAIRY HERD IMPROVEMENT
PROGRAM
A dairy recordkeeping plan
for every herd

- Characteristics of the New USDA Cow Indexes
- Computation and Interpretation of the Percentage of First Lactation Records Culled in Sire Summaries

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Dairy Herd Improvement Letter

CHARACTERISTICS OF THE NEW USDA COW INDEXES

By Rex L. Powell[1]

The U.S. Department of Agriculture (USDA) began calculating genetic indexes for dairy cows in 1963. These estimates of transmitting ability for milk, fat, fat percentage, and dollars are Cow Indexes (CI's). Until the 1981 CI, only data from the cow and her sire (paternal half sisters) were included. Means, standard deviations, and distributions of CI's were published in 1978.[2] A new indexing method[3] was implemented by USDA for the January 1981 CI. The new formula includes the dam's CI computed from data on at least the dam and maternal grandsire. If the dam is indexed under the new procedure, the cow's CI can be affected by her maternal granddam's CI. The increased accuracy in predicting sons' progeny tests was demonstrated[4] using a historical data set. Statistics on the new CI's are needed for theoretical studies and to interpret the CI's properly.

The numbers of cows and means and standard deviations for the July 1980 and January 1981 CI's are given in table 1 for comparison. Both data sets include cows that had calvings during the previous 2 years. New CI's are computed semiannually for all daughters of sires summarized and for cows with records submitted since the previous CI. Thus, a few cows in the January 1981 data set were not evaluated by the new method. The 2-year period for last calving is used to determine which cows have CI's sent to computing centers and which cows are considered further for Elite status. The CI's for milk (CIM) and fat (CIF) are combined into an economic index, CI Dollars (CI$), computed as

$$CI\$ = (\$0.0673 \times CIM) + (\$1.62 \times CIF)$$

Research that applied the old and new CI methods to the same data showed that the mean CIM was increased 13 pounds or less by the new method[4] except for the Ayrshire mean CIM, which was increased 29 pounds. Therefore, the differences in table 1 between the means for the two data sets are largely due to genetic changes in the populations. The means are not directly comparable across breeds, but they do suggest the genetic progress relative to the base population. The standard deviations are of greater interest. The new method increased the standard deviations by 7.3 to 13.7 percent. Addition of the dam's CI to the CI equation increased the range of the CI's.

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[2] Powell, R. L. Properties of USDA-DHIA Cow Indexes. U.S. Dept. Agr. Dairy Herd Impr. Ltr. ARS-60-11, 54(1), 6 pp. 1978.

[3] Powell, R. L. A procedure for including the dam and maternal grandsire in USDA-DHIA Cow Indexes. J. Dairy Sci. 61: 794-800. 1978.

[4] Powell, R. L., Norman, H. D., and Elliott, R. M. Accuracy of genetic indexes of cows from adding relatives. J. Dairy Sci. 64: (In press). 1981.

The means and standard deviations in table 1 were for all cows, both registered and grade. The corresponding values for registered cows only were very similar for all breeds except Holsteins, because 81 to 96 percent of the cows included in the other breeds' data sets were registered but only 46 percent of the Holstein cows were registered. Means and standard deviations for 852,905 registered Holstein cows in the January 1981 data set were $31.3 ± 53.4 for CI$, 291 ± 456 pounds for CIM, and 7.3 ± 16.1 pounds for CIF. Means were lower for registered cows. Previous work[5] has shown that genetic merit of sires of grade cows is higher than that of sires of registered cows. Standard deviations of CI's were larger for registered Holsteins than for all Holsteins, probably because fewer dams (72 percent) are identified for grade cows. Only sire-identified cows are accepted for USDA files. The dam cannot contribute to a CI unless identified, and, therefore, for cows without identified dams, the new method of indexing is exactly the same as the old method.

Tables 2 through 4 show the distributions of CI$, CIM, and CIF. The symmetry of the distributions is impressive. A comparison of the mean and median values is an approximate test for skewness. For CI$, medians are $28 for Ayrshires, $37 for Brown Swiss, $30 for Guernseys, $34 for Holsteins, $44 for Jerseys, and $47 for Milking Shorthorns. These medians are very close to the means and suggest that skewness is not likely to be serious. Tables 2 through 4 provide the basis for determining where a particular cow ranks among all cows of a breed.

Cows of potential interest as dams of bulls are identified and given Elite status. Only registered cows that are likely to be alive (according to last record termination code and calving during the previous 2 years) are considered. Cows must have at least 100 days in milk for a single record and an average of at least three modified contemporaries across lactations. Cows passing these edits are termed "eligible." The other requirements used in January 1981 and the number and percentage Elite are in table 5. The percentage given is determined by dividing the number Elite by the number eligible.

The major screening for Elite status is based on CI$. Although the mean CI$ was changed little by the new procedure, the increased variation caused the CI$ value required for Elite status to increase substantially. The other requirements in table 5 eliminate cows from Elite status that are not likely to be chosen as dams of sires, regardless of their genetic estimates. Removal of these other requirements is under consideration. Elimination of the phenotypic requirements would have increased the number of Elite cows by 8 to 22 percent. Keeping all present requirements except registration would increase the number of cows meeting the standards of table 5 by 3 to 45 percent. The larger increase is for Holsteins because of the larger proportion of grade cows.

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[5] Powell, R. L., Norman, H. D., and Dickinson, F. N. Genetic means and trends of dairy sires in the United States. J. Dairy Sci. 63: 1455-1461. 1980.

Relative rank of higher CI$ cows among eligible cows is indicated in table 6. The percentages generally agree with those in table 2. The most consistent differences are higher percentages for Holsteins in table 6 than in table 2, which are caused by the proportion of grade cows lacking identification of the dam.

In summary, the new method of cow indexing has increased the standard deviations of CI's by 7.3 to 13.7 percent. Increase in variation of CI's was larger for registered cows, because all their dams are identified. The effect of the larger range is most apparent on CI$ values required for Elite status. Tables 2 through 4 and table 6 provide information needed to determine the relative rank of a cow among all cows or among cows eligible for Elite status. Eliminating phenotypic and registration requirements for Elite status would increase the numbers of cows meeting CI$ requirements by 12 to 55 percent.

Table 1.--Numbers of cows and means and standard deviations of Cow Indexes for dollars (CI$), milk (CIM), and fat (CIF) for data released following July 1980 and January 1981 evaluations[1]

Breed	Cows	CI$[2]	CIM	CIF
	Number	Dollars	Pounds	Pounds
		July 1980 (old method)		
Ayrshire	26,862	20.1 ± 39.5	168 ± 327	5.5 ± 11.5
Brown Swiss	34,047	29.4 ± 45.9	242 ± 365	8.2 ± 14.0
Guernsey	74,903	25.1 ± 37.7	191 ± 288	7.6 ± 12.3
Holstein	1,722,085	26.8 ± 45.1	256 ± 389	5.9 ± 13.7
Jersey	113,159	33.8 ± 41.1	282 ± 321	9.2 ± 13.2
Milking Shorthorn	4,266	37.4 ± 42.8	279 ± 343	11.5 ± 12.8
		January 1981 (new method)		
Ayrshire	26,997	27.8 ± 42.4	231 ± 351	7.6 ± 12.4
Brown Swiss	34,592	37.8 ± 50.1	308 ± 400	10.5 ± 15.3
Guernsey	73,744	31.1 ± 41.0	236 ± 313	9.4 ± 13.5
Holstein	1,837,219	33.3 ± 49.0	313 ± 423	7.6 ± 14.8
Jersey	116,215	42.7 ± 46.3	356 ± 365	11.6 ± 14.8
Milking Shorthorn	4,326	49.3 ± 47.6	371 ± 377	15.0 ± 14.3

[1] Data include cows calving during the preceding 2 years.

[2] CI$ = ($0.0673 × CIM) + ($1.62 × CIF).

Table 2.--Frequency distribution of Cow Index Dollars by breed[1]

Range (dollars)	Ayrshire		Brown Swiss		Guernsey		Holstein		Jersey		Milking Shorthorn	
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
More than 169---	0.1	(0.1)	0.5	(0.5)	0.1	(0.1)	0.4	(0.4)	0.3	(0.3)	1.1	(1.1)
160 to 169---	.1	(.2)	.3	(.8)	.1	(.2)	.2	(.6)	.2	(.5)	.4	(1.5)
150 to 159---	.1	(.3)	.5	(1.3)	.1	(.3)	.4	(1.0)	.4	(.9)	.7	(2.2)
140 to 149---	.2	(.5)	.8	(2.1)	.2	(.5)	.6	(1.6)	.7	(1.6)	1.6	(3.8)
130 to 139---	.3	(.8)	1.2	(3.3)	.5	(1.0)	.9	(2.5)	1.1	(2.7)	1.6	(5.4)
120 to 129---	.8	(1.6)	1.8	(5.1)	.9	(1.9)	1.4	(3.9)	1.7	(4.4)	2.3	(7.7)
110 to 119---	1.3	(2.9)	2.5	(7.6)	1.4	(3.3)	2.0	(5.9)	2.6	(7.0)	3.1	(10.8)
100 to 109---	1.9	(4.8)	3.5	(11.1)	2.1	(5.4)	2.7	(8.6)	3.6	(10.6)	4.3	(15.1)
90 to 99---	2.8	(7.6)	4.4	(15.5)	3.2	(8.6)	3.6	(12.2)	4.7	(15.3)	5.0	(20.1)
80 to 89---	3.9	(11.5)	5.3	(20.8)	4.1	(12.7)	4.6	(16.8)	6.1	(21.4)	5.2	(25.3)
70 to 79---	4.8	(16.3)	6.1	(26.9)	5.1	(17.8)	5.7	(22.5)	7.2	(28.6)	6.9	(32.2)
60 to 69---	6.1	(22.4)	6.6	(33.5)	6.2	(24.0)	6.7	(29.2)	8.0	(36.6)	7.5	(39.7)
50 to 59---	7.4	(29.8)	7.1	(40.6)	7.5	(31.5)	7.6	(36.8)	8.6	(45.2)	7.8	(47.5)
40 to 49---	9.0	(38.8)	7.5	(48.1)	8.7	(40.2)	8.2	(45.0)	8.5	(53.7)	8.5	(56.0)
30 to 39---	9.2	(48.0)	7.6	(55.7)	9.5	(49.7)	8.4	(53.4)	8.3	(62.0)	8.1	(64.1)
20 to 29---	9.3	(57.3)	7.6	(63.3)	9.8	(59.5)	8.1	(61.5)	7.7	(69.7)	8.1	(72.2)
10 to 19---	9.3	(66.6)	7.4	(70.7)	9.6	(69.1)	7.6	(69.1)	7.0	(76.7)	6.9	(79.1)
0 to 9---	8.5	(75.1)	6.6	(77.3)	8.7	(77.8)	6.8	(75.9)	6.0	(82.7)	6.1	(85.2)
-10 to -1---	6.8	(81.9)	5.6	(82.9)	7.1	(84.9)	5.9	(81.8)	4.8	(87.5)	4.7	(89.9)
-20 to -11---	5.6	(87.5)	4.9	(87.8)	5.5	(90.4)	4.8	(86.6)	3.8	(91.3)	4.2	(94.1)
-30 to -21---	4.2	(91.7)	3.8	(91.6)	3.8	(94.2)	3.8	(90.4)	2.7	(94.0)	2.6	(96.7)
-40 to -31---	3.2	(94.9)	2.8	(94.4)	2.5	(96.7)	3.0	(93.4)	2.0	(96.0)	1.7	(98.4)
-50 to -41---	2.1	(97.0)	2.0	(96.4)	1.5	(98.2)	2.2	(95.6)	1.5	(97.5)	.8	(99.2)
-60 to -51---	1.2	(98.2)	1.4	(97.8)	.9	(99.1)	1.5	(97.1)	.9	(98.4)	.4	(99.6)
-70 to -61---	.8	(99.0)	.9	(98.7)	.5	(99.6)	1.1	(98.2)	.6	(99.0)	.2	(99.8)
-80 to -71---	.5	(99.5)	.6	(99.3)	.2	(99.8)	.7	(98.9)	.4	(99.4)	.1	(99.9)
Less than -80---	.5	(100.0)	.7	(100.0)	.2	(100.0)	1.1	(100.0)	.6	(100.0)	.1	(100.0)

[1] Cumulative frequencies in parentheses.

Table 3.--Frequency distribution of Cow Index Milk by breed[1]

Range (nearest 10 pounds)	Ayrshire		Brown Swiss		Guernsey		Holstein		Jersey		Milking Shorthorn	
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
More than 1,290---	0.2	(0.2)	0.8	(0.8)	0.1	(0.1)	1.2	(1.2)	0.5	(0.5)	1.0	(1.0)
1,200 to 1,290---	.2	(.4)	.6	(1.4)	.1	(.2)	.8	(2.0)	.5	(1.0)	1.3	(2.3)
1,100 to 1,190---	.3	(.7)	1.0	(2.4)	.3	(.5)	1.3	(3.3)	.9	(1.9)	1.4	(3.7)
1,000 to 1,090---	.9	(1.6)	1.8	(4.2)	.6	(1.1)	2.0	(5.3)	1.8	(3.7)	2.2	(5.9)
900 to 990---	1.4	(3.0)	2.7	(6.9)	1.2	(2.3)	3.0	(8.3)	2.9	(6.6)	2.8	(8.7)
800 to 890---	2.8	(5.8)	4.1	(11.0)	2.1	(4.4)	4.1	(12.4)	4.6	(11.2)	4.5	(13.2)
700 to 790---	4.3	(10.1)	5.8	(16.8)	3.5	(7.9)	5.4	(17.5)	6.3	(17.5)	6.2	(19.4)
600 to 690---	5.4	(15.5)	7.1	(23.9)	5.3	(13.2)	6.8	(24.6)	8.2	(25.7)	7.1	(26.5)
500 to 590---	7.2	(22.7)	8.1	(32.0)	7.2	(20.4)	8.2	(32.8)	10.1	(35.8)	8.7	(35.2)
400 to 490---	8.8	(31.5)	9.4	(41.4)	9.0	(29.4)	9.2	(42.0)	10.7	(46.5)	10.2	(45.4)
300 to 390---	10.1	(41.6)	9.5	(50.9)	11.1	(40.5)	9.6	(57.2)	10.7	(57.2)	10.8	(56.2)
200 to 290---	11.3	(52.9)	10.0	(60.9)	12.6	(53.1)	9.6	(61.2)	10.2	(67.4)	10.5	(66.7)
100 to 190---	11.1	(64.0)	9.0	(69.9)	12.7	(65.8)	8.8	(70.0)	8.9	(76.3)	9.1	(75.8)
0 to 90---	10.7	(74.7)	9.1	(78.0)	11.7	(77.5)	7.7	(77.7)	7.4	(83.7)	8.3	(84.1)
-100 to -10---	8.6	(83.3)	6.8	(84.8)	9.2	(86.7)	6.4	(84.1)	5.8	(89.5)	6.3	(90.4)
-200 to -110---	6.4	(89.7)	5.2	(90.0)	6.3	(93.0)	5.1	(89.2)	4.0	(93.5)	4.4	(94.8)
-300 to -210---	4.5	(94.2)	3.9	(93.9)	3.7	(96.7)	3.7	(92.9)	2.7	(96.2)	2.8	(97.6)
-400 to -310---	2.7	(96.9)	2.6	(96.5)	1.9	(98.6)	2.6	(95.5)	1.7	(97.9)	1.4	(99.0)
-500 to -410---	1.6	(98.5)	1.7	(98.2)	.9	(99.5)	1.8	(97.3)	1.0	(98.9)	.6	(99.6)
-600 to -510---	.8	(99.3)	.9	(99.1)	.3	(99.8)	1.1	(98.4)	.6	(99.5)	.2	(99.8)
-700 to -610---	.4	(99.7)	.5	(99.6)	.1	(99.9)	.7	(99.1)	.3	(99.8)	.1	(99.9)
Less than -700---	.3	(100.0)	.4	(100.0)	.1	(100.0)	.9	(100.0)	.2	(100.0)	.1	(100.0)

[1] Cumulative frequencies in parentheses.

Table 4.--Frequency distribution of Cow Index Fat by breed[1]

Range (pounds)	Ayrshire		Brown Swiss		Guernsey		Holstein		Jersey		Milking Shorthorn	
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
More than 49---	0.1	(0.1)	0.6	(0.6)	0.2	(0.2)	0.3	(0.3)	0.5	(0.5)	1.3	(1.3)
45 to 49---	.1	(.2)	.8	(1.4)	.4	(.6)	.4	(.7)	.8	(1.3)	1.3	(2.6)
40 to 44---	.4	(.6)	1.6	(3.0)	.9	(1.5)	.9	(1.6)	1.7	(3.0)	2.6	(5.2)
35 to 39---	1.0	(1.6)	3.1	(6.1)	2.2	(3.7)	1.8	(3.4)	3.0	(6.0)	4.3	(9.5)
30 to 34---	2.4	(4.0)	5.1)	(11.2)	3.9	(7.6)	3.3	(6.7)	5.1	(11.1)	6.8	(16.3)
25 to 29---	4.6	(8.6)	7.3	(18.5)	6.2	(13.8)	5.6	(12.3)	7.9	(19.0)	8.6	(24.9)
20 to 24---	7.9	(16.5)	9.6	(28.1)	8.6	(22.4)	8.3	(20.6)	10.6	(29.6)	11.1	(36.0)
15 to 19---	11.7	(28.2)	11.1	(39.2)	11.5	(33.9)	11.0	(31.6)	12.4	(42.0)	12.7	(48.7)
10 to 14---	15.3	(43.5)	12.2	(51.4)	14.1	(47.0)	12.9	(44.5)	13.5	(55.5)	14.3	(63.0)
5 to 9---	16.5	(60.0)	16.7	(64.1)	14.9	(62.9)	13.6	(58.1)	12.9	(68.4)	12.9	(75.9)
0 to 4---	14.7	(74.7)	11.8	(75.9)	13.7	(76.6)	19.8	(77.9)	11.3	(79.7)	9.9	(85.8)
-5 to -1---	11.2	(85.9)	9.5	(85.4)	10.6	(87.2)	3.6	(81.5)	8.5	(88.2)	8.1	(93.9)
-10 to -6---	7.0	(92.9)	6.6	(92.0)	6.6	(93.8)	7.7	(89.2)	5.4	(93.6)	3.7	(97.6)
-15 to -11---	4.0	(96.9)	4.0	(96.0)	3.6	(97.4)	5.0	(94.2)	3.1	(96.7)	1.7	(99.3)
-20 to -16---	2.0	(98.9)	2.2	(98.2)	1.7	(99.1)	3.0	(97.2)	1.7	(98.4)	.4	(99.7)
-25 to -21---	.7	(99.6)	1.0	(99.2)	.6	(99.7)	1.6	(98.8)	.9	(99.3)	.2	(99.9)
-30 to -26---	.2	(99.8)	.5	(99.7)	.2	(99.9)	.6	(99.4)	.4	(99.7)	.0	(99.9)
Less than -30---	.2	(100.0)	.3	(100.0)	.1	(100.0)	.6	(100.0)	.3	(100.0)	.1	(100.0)

[1] Cumulative frequencies in parentheses.

Table 5.--Screening levels for mature-equivalent (ME) yield, deviated yield, and Cow Index Dollars (CI$) for a cow to appear on the Elite Cow Index and numbers and percentages of eligible cows qualifying

Breed	Screening levels					Cows qualifying as Elite	
	ME yield		Deviated yield				
	Milk	Fat	Milk	Fat	CI$		
	Pounds	Pounds	Pounds	Pounds	Dollars	Number	Pct
Ayrshire--------------------	12,000	450	1,000	0	106	709	4.0
Brown Swiss-----------------	13,000	510	1,300	0	125	942	4.0
Guernsey--------------------	11,000	470	1,000	0	110	1,597	3.6
Holstein--------------------	15,000	530	1,500	0	151	9,947	1.5
Jersey----------------------	10,000	470	1,000	0	128	2,200	3.0
Milking Shorthorn----------	11,000	400	1,000	0	121	193	6.7

Table 6.--Percentage of cows meeting or exceeding various levels of Cow Index Dollars (CI$) among cows eligible for Elite status

Breed	Percentage at or above CI$ of--						
	110	120	130	140	150	160	170
Ayrshire-------------------	3.3	2.0	1.0	0.6	0.3	0.2	0.1
Brown Swiss----------------	6.9	4.9	3.3	2.2	1.4	.9	.6
Guernsey-------------------	3.6	2.2	1.2	.7	.4	.2	.1
Holstein-------------------	6.4	4.7	3.4	2.4	1.6	1.0	.6
Jersey---------------------	6.2	4.1	2.7	1.7	1.0	.6	.3
Milking Shorthorn----------	9.3	6.9	5.2	3.6	2.1	1.5	1.1

COMPUTATION AND INTERPRETATION OF THE PERCENTAGE OF FIRST LACTATION RECORDS CULLED IN SIRE SUMMARIES

By Rex L. Powell[1]

Profitable cows are not only productive but free from problems that lead to added expense or shortened lives. Only production is considered in Predicted Difference (PD). Supplemental information in the form of the percentage of first lactation records culled (%CUL) is included with PD's when released. The %CUL is the percentage of records having termination codes 3 through 7[2] among first lactation records initiated at least a year before the cutoff date for the USDA-DHIA Sire Summary run. Termination codes 3 through 7 indicate that the cow was sold for other than dairy purposes or had died.

The 1-year interval insures that all lactations considered have had an opportunity to reach 305 days and that their records have been submitted to the Animal Improvement Programs Laboratory. Without the year requirement, %CUL would be too high, because the first cows with terminated lactations would have codes 3 through 7 and cows going dry or reaching 305 days would not be fairly represented. To be released, the %CUL must be based on at least 20 usable daughters meeting the above requirement. This change from the previous requirement of 10 daughters takes effect with the July 1981 Summary and should make the %CUL more indicative of the final culling rate.

A double asterisk (**) in the %CUL field means that fewer than 50 percent of the daughters had first lactation records. If there were not 20 daughters with first lactations initiated a year before the cutoff date for a Sire Summary run, a triple asterisk (***) appears. If both conditions exist, ** takes precedence over ***.

The most common misunderstanding regarding %CUL is the number of daughters used in the calculation. If there are 50 daughters in a Sire Summary, %CUL often is assumed to be based on all 50 daughters. In fact, it is possible that none of the 50 were eligible for inclusion in %CUL.

The %CUL is given in the heading of Form 1202 (USDA-DHIA Sire Summary Record). It is not easy to verify %CUL from the daughter data on this form, because the data are designed to provide the latest status for each daughter. Specifically, the date and age of last calving, last termination code, and the code[3] may pertain to a record in progress (RIP) that was too short (less than 40 days) to be included in genetic evaluations. Average days in milk, number of records, and other information pertain to the data used in genetic evaluations.

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[1] Research geneticist (animal), Animal Improvement Programs Laboratory, Animal Science Institute, Beltsville Agricultural Research Center, Beltsville, Md. 20705.

[2] U.S. Department of Agriculture. Codes used in the National Cooperative Dairy Herd Improvement Program. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 57(1), pp. 12-15. 1981.

As an example, assume a July 1981 Sire Summary for a bull includes information from 89 daughters. To compute %CUL, we first need to select the daughters to be considered.[4] Single lactation cows must have calved 365 days before the cutoff date for the Sire Summary run. The cutoff date varies but is approximately May 20 for the July run and November 20 for the January run.

A Form 1202 with a line of information for each of 12 daughters of our example bull is in figure 1. The data demonstrate many of the situations encountered when trying to determine which daughters contributed to %CUL. Daughters 21XYZ1258 and 21XYZ1901 were included in %CUL as having milked 305 days or gone dry earlier (termination code 0) for the first lactation. Note that a blank is used on Form 1202 instead of a zero so that nonzero codes are identified more readily. Daughters 21XYZ1260, 21XYZ1949, and 21XYZ1987 have first calving dates that are after the cutoff date for the run. Therefore, they are not included in %CUL. Daughter 21XYZ1953 had a borderline calving date but was not included in %CUL because the age at calving did not fit the definition of a first lactation.[5] In general, if the number of records is greater than 1, the daughter is included in %CUL as having a first lactation termination code of 0. Thus, 21XYZ1417 and 21XYZ1851 are included in %CUL.

At first glance, 21XYZ1842 would not appear to qualify for %CUL because of the single record, being too old, and calving too recently. However, the age and date of calving are for her second lactation. There are two clues: A single record of 305 days would not have started with the listed calving date and a 305-day record would not be a RIP. Therefore, she is included in %CUL. Daughters 21XYZ1912 and 21XYZ1917 are included in %CUL as culled daughters. The reasons for culling were mastitis or other udder problem (termination code 7) and low production (termination code 3). Daughter 21XYZ1941 was sold for dairy purposes and is included in %CUL but is not treated as a cull. Remember that %CUL is the percentage of qualifying first lactations terminated with codes 3 through 7. Of the 12 daughters in figure 1, 8 were included in %CUL with 2 of them culls.

Of the 89 daughters in our example, 25 qualified and 5 were culled; therefore, %CUL was 20 percent. Of the 64 daughters not qualifying, 58 had single lactation RIP's. One was too old at first calving, and five were culled or had complete lactations but had calved too recently. Only 25 of 89 daughters qualified for inclusion of their records in computing %CUL.

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[3] Only two nonblank characters appear in the column entitled "Code." An R indicates the last record is a record in progress and is accompanied by a termination code of 1. An N indicates that there were no usable records for the daughter.

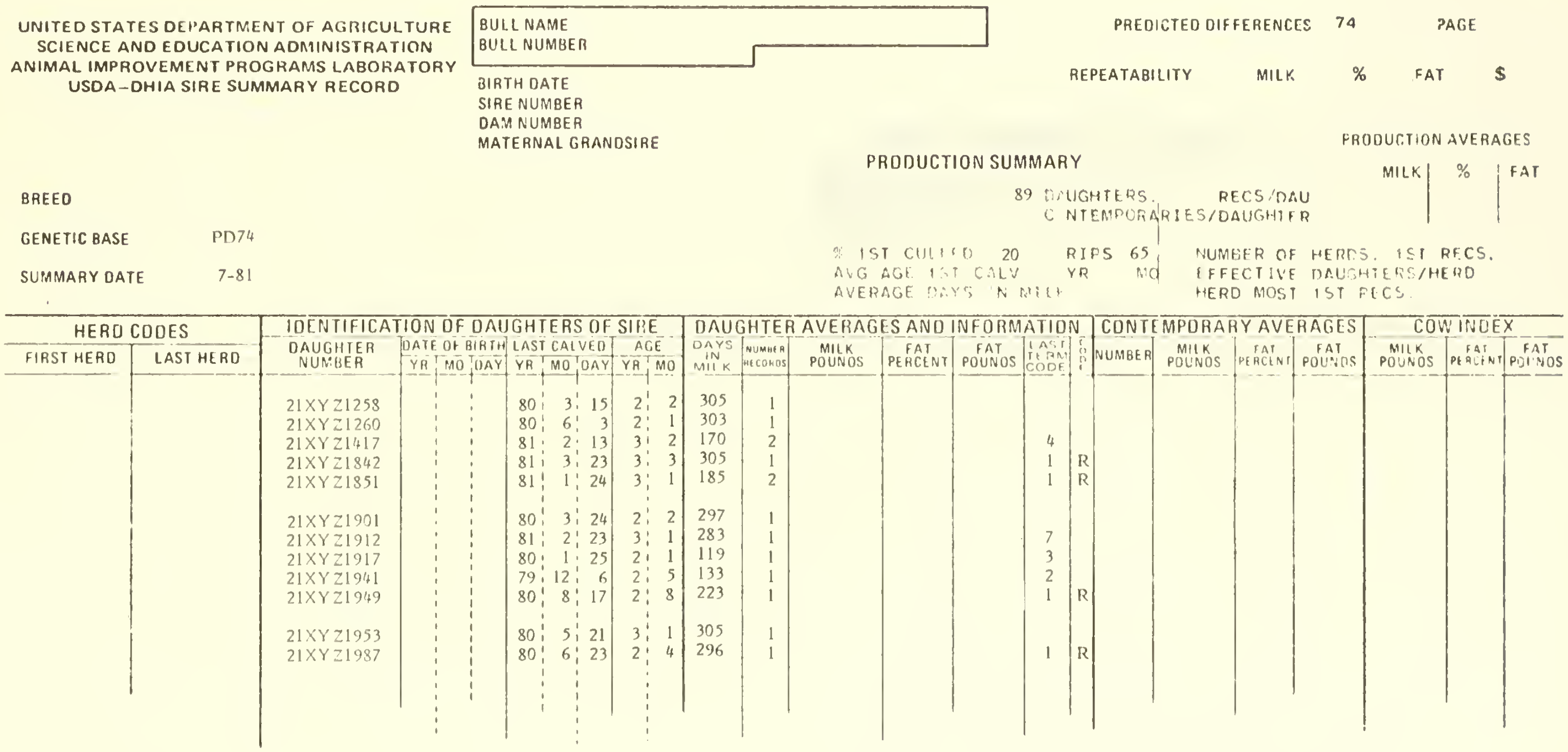
[4] The 89 daughters do not include any daughters with an N in the "Code" column.

[5] First lactations are those without a previous dry period and initiated at less than 36 months (1,096 days) of age when coded as a first lactation or less than 35 months (1,065 days) when lactation number is not reported.

The percentage of first lactations that are RIP's (%RIP) can be a guide to the number of cows qualifying. In this example, %RIP is 65 percent (100 × 58/89). The maximum number of cows that could qualify is the number of daughters times [1 - (%RIP/100)] or, in this example, 89 × (1-0.65) = 31. This approximation is helpful in understanding %CUL. If %RIP is high for a young bull, the %CUL entry almost always will be ***. If %CUL is reported, the approximation gives the maximum number of cows that could be included and thus indicates relative accuracy.

What does the 20 percent mean? Of cows that were judged to have had an opportunity to complete their first lactation normally, 20 percent did not. Average %CUL is about 10 percent; therefore, the bull in the example has a high culling rate. As a rule, high %CUL is an unfavorable trait for a bull. Primary emphasis should be on PD, and that emphasis tends to favor low %CUL bulls, because sire PD for milk yield and %CUL are correlated -0.20 to -0.45. However, when based on a small number of daughters, high or low %CUL may suggest that the sample reflects conditions that are unusual and unlikely to be repeated. There is some evidence that low %CUL may indicate that later PD's will decrease as larger samples of daughters are available. Thus, a high %CUL may be positively associated with a future increase in PD and vice versa, in contrast with the normal inference that a high %CUL is always undesirable. Based on small numbers of daughters, %CUL suggests the direction of change in PD, but with limited accuracy. Based on large numbers of daughters, %CUL largely reflects what is known already from the PD but also may suggest differences in daughter reproduction, udder characteristics, and many other traits bearing on dairyman satisfaction with a bull's daughters.

GPO 880-787



UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION
ANIMAL IMPROVEMENT PROGRAMS LABORATORY
USDA–DHIA SIRE SUMMARY RECORD

BULL NAME
BULL NUMBER

BIRTH DATE
SIRE NUMBER
DAM NUMBER
MATERNAL GRANDSIRE

PREDICTED DIFFERENCES 74 PAGE

REPEATABILITY MILK % FAT $

BREED

GENETIC BASE PD74

SUMMARY DATE 7-81

PRODUCTION SUMMARY

89 DAUGHTERS. RECS/DAU
CONTEMPORARIES/DAUGHTER

% 1ST CULLED 20 RIPS 65
AVG AGE 1ST CALV YR MO
AVERAGE DAYS IN MILK

NUMBER OF HERDS. 1ST RECS.
EFFECTIVE DAUGHTERS/HERD
HERD MOST 1ST RECS.

PRODUCTION AVERAGES

MILK	%	FAT

HERD CODES		IDENTIFICATION OF DAUGHTERS OF SIRE									DAUGHTER AVERAGES AND INFORMATION							CONTEMPORARY AVERAGES				COW INDEX		
FIRST HERD	LAST HERD	DAUGHTER NUMBER	DATE OF BIRTH			LAST CALVED			AGE		DAYS IN MILK	NUMBER RECORDS	MILK POUNDS	FAT PERCENT	FAT POUNDS	LAST TERM CODE	CODE	NUMBER	MILK POUNDS	FAT PERCENT	FAT POUNDS	MILK POUNDS	FAT PERCENT	FAT POUNDS
			YR	MO	DAY	YR	MO	DAY	YR	MO														
		21XYZ1258				80	3	15	2	2	305	1												
		21XYZ1260				80	6	3	2	1	303	1												
		21XYZ1417				81	2	13	3	2	170	2				4								
		21XYZ1842				81	3	23	3	3	305	1				1	R							
		21XYZ1851				81	1	24	3	1	185	2				1	R							
		21XYZ1901				80	3	24	2	2	297	1												
		21XYZ1912				81	2	23	3	1	283	1				7								
		21XYZ1917				80	1	25	2	1	119	1				3								
		21XYZ1941				79	12	6	2	5	133	1				2								
		21XYZ1949				80	8	17	2	8	223	1				1	R							
		21XYZ1953				80	5	21	3	1	305	1												
		21XYZ1987				80	6	23	2	4	296	1				1	R							

Figure 1.--Pertinent data from a Form 1202.

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